

THE CANNON

Thanksgiving Issue

October 10, 1979

University of Toronto Engineering Society

Volume II Number 3

CAB Visits Faculty Accreditation Renewal

On October 29 and 30, an eleven member team from the Canadian Accreditation Board (CAB) will visit the Faculty of Engineering at the University of Toronto, to evaluate the quality of the undergraduate education program. If all goes well, the 17 programs offered by the Faculty (one Civil, three Geological, one Mechanical, one Industrial, eight Engineering Science, one Chemical, one Electrical, one Metallurgy and Material Science) will be accredited for another five years.

The effect of accreditation, from the recently graduated engineer's perspective, is to allow him/her to become a registered professional engineer (P.Eng.) by simply completing two years of work under another P.Eng. and then passing a written ethics exam. Without accreditation of his program, each and every graduate wishing to become a P.Eng. would have to apply individually to the CAB to do so. The CAB could ask all of these graduates to write technical exams at this point to verify their technical competence.

The UofT has always had every one of its engineering programs accredited throughout its history and, according to Associate Dean Miller, the Faculty should pass this evaluation with flying colours. He boasts that this Faculty has "the best record of its type in the country," and thus predicts that the CAB will renew the Faculty's accreditation when they visit this

October.

In preparation for the on campus visit by the CAB team, the Faculty administration has compiled several lengthy reports for the CAB detailing the academic programs offered, the teaching staff's qualifications and the Faculty's budget breakdown. These reports were sent to the CAB last spring.

One of the most important questions to which the reports address themselves is that of the adequacy of the academic program. The CAB stipulates that a four year (eight term) undergraduate engineering program in Canada shall consist of at least one half of a year (i.e. six half year courses) in each of the following areas 1) Humanities, Social and Administration Sciences, 2) Mathematics, 3) Basic Sciences, 4) Engineering Sciences, 5) Design and Synthesis. As well, the CAB requires the sum of item 4 and item 5 to be at least two years. Note that this effectively specifies the content of 3½ years out of 4.

In order to convince the CAB that the Faculty does live up to these standards, a computer collation of all the courses taken by the classes of 7T8, 7T9, and 8T0 was prepared. (8T0 courses were based on pre-registration data.) Then the 2693 different courses attended by the students were rated as to their content of each of the five CAB categories; (i.e. one particular course could have been rated as one eighth of a year

year engineering sciences and one quarter of a year design and synthesis.) Then every student, except special students, repeaters or advanced standing students, in 7T8, 7T9, and 8T0 had the ratings of their particular four year program totalled and a statistical analysis of this population was made. The results show that a large majority of the students (approximately 90%) meet all of the CAB minimums.

When asked about the effect of the cutback in funding supplied by the Ontario government on accreditation renewal, Dean Miller replied that he was "concerned" about the funding problem and he felt that the Faculty had so far "managed to cope" with the cutbacks but "if they (the Ontario government) continue to compress the funding by 2½% to 3% per year...we will have problems." Dean Miller did not feel that the Faculty's accreditation would be endangered by the cutbacks this year. He also pointed out that the CAB was "disappointed" that Ontario's level of funding for universities is the third worst among the ten provinces.

Miller also pointed out that both the Faculty's reports to the CAB and the CAB's report to the Faculty are confidential according to CAB rules. Except for the final result, either renewal or rejection of accreditation, students will never see any of the reports justifying a decision which will primarily affect their future.

By Hubert Vogt



Occupational Health

Within the past few years, occupational health and safety has become a matter of great public concern. Consider this: last year the Workmen's Compensation Board paid out about \$400,000,000 to employees injured at their workplace. Indirect costs are three to five times the amount. That money, coming from company payments, increases the cost of doing business and could clearly be put to better use, not to mention the enormous time lost.

Occupational Health and Safety encompasses many things. First there is the diagnosis and treatment of illnesses and injuries as a result of work related hazards and accidents. This is the field of occupational medicine. Examples are, people affected while working with toxic chemicals, and those injured while working on construction sites. However much a doctor can do to treat the

patient and to identify toxic chemicals, he/she is not in a position to change the workplace to a more safe environ. This is where the engineer comes in.

There were engineers long before there were occupational physicians so the engineer can do a lot to make a safe working environment. Industrial Hygiene involves the recognition and evaluation of hazards in the workplace and the recommendation of control strategies such as the identification and monitoring of toxic chemicals. Occupational health engineering works towards eliminating or reducing work related hazards by designing new processing and machines. New processes include ventilation, protective equipment, material substitution. The role of the engineer is one of prevention.

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The McNaughton Centre — A playroom for electrical engineers — opening soon. Details on page 3.

Special Feature Centre Spread

All Chemicals aren't in oil

At this time of the year, 4th year students start looking for employment and the question of "What type of job is best suited to me?" or "What type of job is going to give me the training I require for the career path I have in mind?" is often raised. Many graduates are interested in a job that will give a good technical training as well as leading into the management stream. The Cannon went looking for an employer who would be interested in hiring an engineer oriented towards a technical management career. Procter and Gamble was found to be such a company.

Procter and Gamble is a very innovative and progressive company and as such it is essential that all of their managers keep abreast of new technology. For this reason

90% of the managers Procter and Gamble hires are engineers.

Company spokesman Ken Lendrum feels that graduate engineers are equipped with the technical background needed to apply new technology to the business and are able to develop the people skills necessary to become an effective manager.

Mr. Lendrum said that when they look at an initial application they are looking at three basic things: academics, extracurricular activities and past experience. Ideally, one would like a happy marriage of all three but realistically, compromises must be made. As a prospective employer, Ken realizes that when an individual has accepted a substantial amount of responsibility at

school due to involvement in Skule activities or because they have to work 30 hours a week, their marks will invariably suffer. Employers are willing to accept this business because "The best way to judge what someone can do, is by what they have done." During the interview the prospective employee must demonstrate their ability to draw on their past experiences and show the relevance to the job being applied for.

Mr. Lendrum also mentioned the type of preparation expected for the interview. In the first interview the applicant is expected to have read over the company brochure outlining the types of starting assignments, where the company plants are located and the type of

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Health

cont'd from page 1

The engineer occupies a lowly rung in the public eye. This is because the engineer does not deal with sick people as such, and so does not know who his/her "patients" are, and they in turn do not know who their true saviour is. The doctor, by virtue of continuous contact with patients, is held in awe. The engineer is often an anonymous entity who receives little or no credit.

One famous professor in the University of Toronto's Department of Chemical Engineering (who shall remain anonymous for his own safety!) said that engineers have done more for public health and safety than the whole medical field can ever do.

An example of this is municipal engineering. The meds could identify diseases such as cholera caused by unsanitary conditions but they couldn't "prevent" it. It was up to the engineers to eliminate the problem. This was done by installing city-wide water distribution systems and sewage treatment and disposal systems, etc.

Most revolutions in the medical field result from new engineering technologies. An example of this is the above, where better sanitation was needed to eliminate once fatal diseases. Dr.

Bette Stephenson, when she was Minister of Labour, suggested that the major inroads in protecting the worker will be made by the engineer.

Bill 70, about to become law when regulations have been finalized, is a boon for all those concerned with occupational health and safety. Called "The Occupational Health and Safety Act" when law, the bill replaces several other acts dealing with work safety. The bill states the duties of the employer, employee and government in the prevention of industrial work hazards.

Of course there are huge costs involved in implementing preventative measures. Costs include expenditures for training programs and materials. Control is costly since energy is required to make them work, for example, ventilation. But nevertheless, there are benefits. Some are: reduced WCB payments, insurance premiums and time. There are also social benefits such as reduced hospital costs, UIC payments, welfare, emotional stress and an increase of worker morale.

But it must be noted that there is no such thing as an "Absolutely" safe work place. Not even your own home is absolutely safe. Even "best available" may be so uneconomical there won't be a health and safety problem to worry about since the plant won't exist. There will be "safe working

conditions" but there are and always will be risks, and society must accept them. Would Newton have discovered the law of gravity if the apple did not fall down and bruise his head? Nature did not intend a risk-free world.

There is a strong demand for occupational health and safety professionals. According to Dr. Stephenson, there is an immediate need for 750 professionals, including 100 hygienists and 250 health and safety engineers. Eventually there will be a need for 2530 professionals including 702 engineers to reach a level of 26/100,000 workers (still considered low).

Bill 70 will make the demand for trained engineers even greater. There will be a demand for engineers with bachelors and masters degrees. The Department of Chemical Engineering has about 25 masters candidates studying in the area of Occupational Health and Safety, and nine have graduated in the past year.

The Department of Chemical Engineering has an international reputation in the occupational health and safety field. Professors M. E. Charles and J. W. Smith, the Department chairman and Associate chairman respectively, have played leading roles in the development of teaching and research in the department. Professor Smith is studying the

electrochemical processes of refining and winning of metals to reduce hazards associated with them.

Other research in the department includes studying the kinetics of heavy water reactors to reduce accidents and hazards to operating staff; developing a personal dosimeter for the detection of nitric oxide; testing and evaluating personal alpha dosimeters for measuring radon daughters in uranium mines; the development of a rubber disc to absorb organic vapours; finding ways to desulphurize industrial gases, etc., involving about fifteen staff members.

If you have read this far, you must be interested in how you can go about and not worry about job security for the rest of your life. The UofT Department of Chemical Engineering places a special emphasis on the prevention of work dangers. A bachelors degree is a minimum requirement in the field. There were about eighteen students who did their fourth year thesis relating to occupational health and safety.

The masters program is for those who want to broaden their knowledge of engineering technology, and also for those that will want to be certified as industrial hygienists. The M.A.Sc. and Ph.D. programs are research oriented, while the M.Eng. gives the candidate

proper.

Profanities and ignorant phrases are not a policy of the Cannon. As for his comments on the Toike Oike, those belong in the Toike Oike, not the Cannon!

People should realize how much work is involved in putting out a newspaper, even a small one like the Cannon. It involves long hours of hard work on the part of many people. Why don't people come out and give a hand supporting the paper instead of complaining? It would be greatly appreciated.

Alan Suran

industrial experience for professional and management roles.

A background in Chemical Engineering is not necessary to enter the programs, but an interest in chemistry is. To be certified by the American Industrial Hygienists Association, you must have postgraduate training, five years work experience in the field, and also write an exam set by the board. More information about the programs can be obtained by contacting the Chemical Engineering office.

For those with a morbid interest in such things, average starting salaries are \$18,000 - 20,000.

Engineers have always been directly involved with producing goods at the lowest possible cost. They have a role in how well a country is doing economically. Occupational health and safety is another aspect, which in the long run will make the nation more productive.

Engineers have a significant part to play mainly because of two aspects of the profession. They are trained in process design which allows them to be involved from the very beginning. Engineers are also usually in some authority or managerial role, whether it be company president or plant manager. Thus they have a great influence on the safety of the work place. Wendy Eng

EDITORIAL

OKTOBERFEST

Friday Oct. 12

Drill Hall

6:00 pm — 1:00 am

Admission \$3.50

Tickets at Eng Stores



Letters to the Editor

An open letter to Wilson Lee-Wing:

Sir,

Your letter opens, "The Cannon has become a garbage newspaper." How can you say that? Do you, a graduate, actually consider one issue a statistically significant sample? Next you call the Cannon a "technical newspaper". Certainly technical articles play a part of content but, remember that the Cannon replaced the Tiny Toikes and the Cannon expands upon the happenings in the Eng Soc.

Complaints in your letter also state that you objects to the types to ads published. Ads are revenue! I hope that you don't seriously believe that a paper can be published without costs. If you really object to the type of ads that are accepted, you are welcome to solicit acceptable ads such as Crown Royal in Scientific American, or make a contribution yourself. Also you express displeasure with phrases such as "dumb F". This phrase also appears in an article written by one of engineering's SAC directors, and under the Cannon Publishing Policy has precedence. Perhaps you would like to suggest a change in the policy that requires the editors to remove articles, regardless of importance, because they contain colloquialisms instead of multi-syllabic words.

What "light-hearted buffoonery? gossip? swearing"?!! This you stated belongs in the Toike, which according to your P.S. should not be printed anyway. Another question, why does Dr. Scott, who is chairman of the department of which you are a graduate, get a mention? Professors are always welcome to submit articles but what would you have them write for the first issue, 'What I did during my summer vacation?', provided you can locate one over the summer.

Using your test sample of one issue you have extrapolated the format of the newspaper for the rest of the year and then made a complaint regarding the future based on it. If you think things are that bad, why hasn't anyone seen you breaking down the office doors to offer assistance? To me, your criticisms seem hasty for a "professionally trained technical" person as you classify engineers. I firmly believe that the editors of the Cannon are doing an excellent job.

Bill Mark
Elec 8T2

Dear Ms.'s Editors:

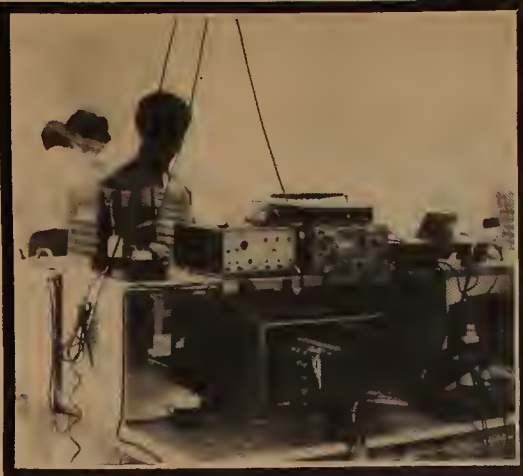
Congratulations! After a year of rather dull articles, on the most part, and dull format, the CANNON is becoming an interesting paper in which engineering undergraduates and their professors can express their interests, both academic and extracurricular.

Finally the news of the Engineering Society is being made readily accessible to the students, giving them the opportunity to know what events of interest are appearing on the horizon as well as giving them insight into the workings of their Society. I'm especially happy to see articles printed which have been written by our own U. of T. alumni and undergrads. Giving them a chance to explore the fascinating world of journalism and publications makes this a valuable medium.

Keep up the good work.
Peter Noble
Chemical 7T9

Notice

IF anyone purchased two Oktoberfest tickets that weren't stamped and numbered, last Monday, Oct. 2nd, please come see Dave Lesgrasley (VP of Activities) in the Society Offices.



McNaughton Centre

On October the seventeenth, the official opening of the University of Toronto's IEEE student chapter's McNaughton Centre will take place. The opening will be followed by a talk by Mr. Ted Glass, the chairman of the Toronto regional branch of the IEEE, on Gen. McNaughton's contributions to Canadian electrical engineering. The talk will start at 1:00 p.m. in Convocation Hall. Following the talk there will be an informal get-together in the Council Chambers (GB 202). Refreshments will be served. IEEE members, students and staff are urged to attend.

The original conception of the McNaughton room was of a semi-private or private work area in which IEEE members would have access to electronic test equipment, tools, data books and most of the current IEEE literature. Therefore, members who previously could not obtain access to certain pieces of equipment at their convenience, and thus maybe put off design, prototyping and construction of relevant projects will now get the opportunity to do so.

The student branch has been allowed to use room 316 in the

obtained sufficient funds with which to equip the room with some very high-quality equipment. This equipment has already been purchased and includes a complete range of electronic tools, a temperature controlled soldering station, wire wrapping facilities, a 50 MHz dual-trace delayed sweep scope, two digital multimeters, a function generator, proto boards and power supplies. Also an 1802 microprocessor evaluation kit is in the process of being acquired. With funds we have left, we will possibly acquire a multi-channel logic analyzer.

This room alone should be enough of an incentive for aspiring electrical engineers, who are seriously interested in their field, to become IEEE student members and make use of the excellent facilities offered by the student branch.

If, after reading this article your professional interest has been raised by even the tiniest differential, come on out to the opening ceremony at Con Hall on the 17th, and contact your class rep about joining.

Mark Alexander
Vice President
IEEE Student Branch

Chemicals

cont'd from page 1

products they manufacture. "As the company develops an interest in an individual they expect that individual to develop more of an interest in the company."

Mr. Lendrum then went on to discuss the training programme which a newly hired engineer receives at Procter and Gamble. The engineer receives an in-depth 3-4 month on-the-job training, uniquely tailored to the job he/she is starting in. There are seven starting assignments; for example, a chemical engineer might start as a technical manager who undertakes responsibility for engineering matters relating to areas such as increased production capacity and new product facilities. A mechanical engineer might start as a project supervisor responsible for a number of different projects including the installation and modification of both new and existing equipment.

Since Procter and Gamble promotes entirely from within the opportunities, after the first 2 or 3 assignments, for the engineer who is able to perform

and is interested in moving are limitless. "We don't have enough people developed far enough to grow as fast as we are able to grow."

The conversation ended with a short discussion as to what Procter and Gamble is currently involved in. Procter and Gamble does not deal exclusively with soap, which is what this writer and I'm sure many others thought. Procter and Gamble manufactures a selection of many diverse products. These range from the soap and detergent products to such surprising products as cake mixes, edible oils (Crisco), potato chips and a wide range of paper products. With Procter and Gamble doubling in size every ten years Mr. Lendrum felt that there would be room for research and development within Procter and Gamble for quite a while to come.

In conclusion if after four years of schooling in engineering, someone were to tell you that engineers are usually dull and know only what they've specialized in, you can tell them that companies such as Procter and Gamble are proving them wrong.

CANNON Staff



Something extra from Labatt's.

What's Going On

Anyone who has taken even the slightest bit of interest in 'Skule' politics over the last year and a half has invariably heard about the 'Text Entry and Editing System'. Unfortunately, even though many people have heard about it, few really understand what it was all about. Last month the Engineering Society decided to dispense with the project. In the hope of providing the student body with some knowledge of what had occurred, the Cannon is providing a summary of what was involved.

The Cannon is merely presenting the facts as they have been presented to us. The opinions expressed are not necessarily those of the staff.

System Description

This description is based on the original project proposal.

Overall System

The system is composed of four separate units, each of which is a stand-alone, dedicated microcomputer using the 1802 microprocessor. Text is stored in digital form on special mini-cassette magnetic tapes.

The text is normally entered at one of two 'Terminals' which display the last few paragraphs on a TV screen. The text is automatically formatted and recorded onto the tape as the typist works.

The finished tapes are loaded into the Editor for proofreading, correction and modification using extensive keyboard commands and a video display screen. The final text is loaded onto another cassette (one for a whole Toike) and taken to the typesetting facility.

The tape is loaded into the Interface unit which performs the necessary buffering and conversion to make it compatible with commercial phototypesetters. The final typeset copy is returned to the Eng Soc offices for pasteur.

Terminals

The Terminals are designed for maximum convenience and use by unskilled users. Copy is typed in normally on a standard typewriter format

keyboard, but without carriage returns at the end of each line. At the end of each paragraph a special key is pressed, and the necessary typesetting control code (e.g. Quad Left, Return, En Space, Em Space) is automatically entered. The Terminal displays up to three pages of 512 characters (about 80 words each) on a standard TV set. The copy is automatically entered on the display as it is typed.

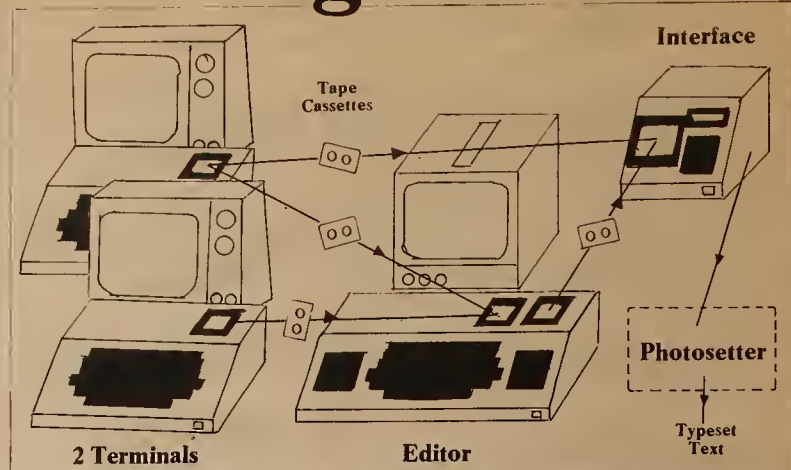
Corrections are made by backspacing and retyping the correct text. When a sufficient amount of data has been entered, or the end of an article is reached, excess blanks are deleted and the text is automatically formatted into files and stored on tape without the need for any operator intervention.

Optional features would include a characters per article counter, floppy disk storage and so on.

Video Editor

The 'Editor' is designed for proofreading, correction and modification of text, as well as use as an electronic typewriter. It supports all of the features of commercial systems as well as providing a number of additional features.

Text can be entered from the



keyboard or from magnetic tape, and is ultimately stored on tape. The tape system is under full software control, with automatic file maintenance and search routines controlled from the keyboard, as well as manual read/write control.

The text is displayed on a video screen in a high quality 14 line by 64 character upper/lower case (and special symbols) format. The memory holds up to 128 lines of text, or over 1,200 words, at any one time. Any character in the memory may be accessed by a combination of paging, scrolling, and cursor controls provided by a special keypad on the keyboard. If an article is longer than 1,200 words it is loaded from or to the tapes as required, under the system control.

A status display line at the top of the

screen shows the current editor control mode. Special keys are provided for editing commands such as Delete, Insert, Move, Search, Replace, Clear, Load, and Write, as well as utility functions such as line count and column-inch calculation.

Future options would include conversion to floppy disk storage or compatibility with commercial microcomputer components (including voice input/output, line printers, etc.).

Phototypesetter Interface

The 'Interface' unit reads the text from cassette tape and converts it to a form compatible with a commercial phototypesetting machine. It has a 2048 character internal buffer, and automatically reads more from tape as copy is output to the photo unit.

An eight character alphanumeric LED display is used for status messages, or, in conjunction with the control keyboard, reading any of the text currently in the memory. The operator can command the unit to read the next article on the tape, search for a particular article, or output the current one.

As an article is output, the text is displayed, formatted and converted to the appropriate machine code, buffered, then fed to the photosetter as required. At the end of each article the Interface displays a 'DONE' message, rings an electronic 'bell', and awaits the operator's next command.

The Interface is specifically designed to be easily adapted to different typesetters, with most of the detailed processing done in software.

Interfacing the System

The system would not produce typeset output without a phototypesetting machine.

Last year the Eng Soc's typesetting was done by the newspaper, which operates a 'Compewriter IV' phototypesetting machine in its Old Metro Library building office. Late this June, the Communications Committee decided to investigate the possibility of connecting the editing system to this machine instead of the one originally specified in the contract.

On July 4, SBS presented a proposal outlining the scope and cost of a technical feasibility study for the change, and the next week Eng Soc President Gary Jones contacted the newspaper to see if they would share the \$200 cost of the study. "I was quite overwhelmed," said Graham Rockingham, a member of the Board of Directors of Planet Publications Inc., publishers of the newspaper. In an interview with the Cannon, Rockingham stated that he felt they were "being pushed" into a decision, as Jones wanted an answer within two days. The directors discussed the matter and agreed to let the study proceed, but since at the time they thought most of the benefits would go to the Eng Soc, they turned down the cost-sharing.

The study, finished on July 31, repor-



The Interface unit.

ted that this sort of interfacing had been done successfully with other models in the Compewriter series, and described the technical details involved. The report warned that a decision had to be made by August 6 to avoid disrupting the overall system schedule, and concluded that the change was practical, relatively simple, and would cost under \$300.

At first, the directors were skeptical about whether the Eng Soc "could accomplish this, from dealing with the executive," Rockingham said. Feeling they were not technically competent to make the decision, the Board consulted with the newspaper staff, the machine's

manufacturer, and with SBS. They "began to feel more confident in Hartwell's and Steel Breeze's ability to make the hookup without damage to the machine and with a minimum of wear and tear."

According to Rockingham, they weren't sure that the editing system was needed in the first place. They felt that they were giving very good rates for typesetting as it was, which would seem to make it economically unfeasible for the Eng Soc to proceed.

However, they could foresee the use of extra type inputs in the future, and were interested in the on-line editing system which would also benefit the Corporation as it expanded. This greater use of the system would be to the Society's financial benefit as well.

By the end of the summer, the directors were "coming around", and had come to the point where they sat down and figured out the dollars and cents of the hookup. (This data is presented in John Byrne's report to the Executive, Sept. 11, 1979). Rockingham said that they were "all but ready to go and say yes," and were waiting to hear from the Society when they heard rumours of the system's cancellation. "We were not informed," he said, and declined further comment.

Report to the Executive Committee

This report, presented to the Executive on Sept. 11, 1979 by Communications Chairman John Byrne, formed the basis of Council's decision.

Re: Options for interfacing Text Entry and Editing System with Phototypesetter.

NOTE: Last year we used Newspaper system at \$12/hr. for 155 hrs. a total of \$1860 was paid.

OPTIONS:

1. Eric Rosen Enterprises: Interface to Computape II as called for in original contract at a rate of \$12.50/page, no hourly rental - at projected output of 160 pages, cost: \$2000. This is not feasible as it is more expensive.

2. Newspaper Compewriter IV - interface through keyboard. The new rate at \$20.00, but is 3 times faster: therefore there is a savings of \$27.00 dollars per year, only if it is as efficient as claimed.

This interface would involve new work at extra costs. The type of interface not done before. \$6773 are total costs for systems, at \$827 savings per year this means 8 years to pay off. What with problems in the Editor: i.e. (4-6 weeks yet for completion although entire system was 6 weeks away for completion Aug. 21, 1978.)

-problems with interface will be unavoidable and thus rate of return is not enough to warrant continuation.

Some discussion ensued.

John mentioned the economic feasibility of the system has changed since the Newspaper came into existence. He said we have approximately \$5000 in parts and if we decide to scrap the system now, we may be able to sell these parts off for, at best, \$3000. This will mean a loss of approximately \$3000, including \$1000 to SBS not including interest.

John's recommendation was to scrap the system.

MOTION: "I move that the Engineering Society terminates their contract with Steel Breeze Systems, repossess the parts of the Text Entry and Editing System, sell them off at the best price, and write off the cost as a loss."

John Byrne, Scott Fowler Motion clearly carried, with unanimous consent.

Other Interesting Trivia

What Is Typesetting?

The easiest way to explain this is by example. The text you are now reading has been typeset.

This has not.

The mechanics are a bit more involved. In this case, for each individual letter a strobe light was flashed at just the right moment to shine through a negative of the letter mounted on a spinning drum, and the image passed through a complex system of mirrors and lenses to ultimately expose just the right spot on a piece of photographic paper.

The entire process is electromechanically controlled by a maze of electronics equivalent to a small computer, which also spaces the words and decides when and where to hyphenate so that the right edge of the text is lined up.

The typesetting for this issue of the Cannon will cost about \$200.

Selling the Surplus

The system was originally intended to have four Terminals to deal with the high writer demand at Toike makeups, though for general use two would be adequate.

Due to the "tight budget" situation last year, a suggestion was made to convert the already bought parts for two of the Terminals into one Editor. This could then be rented out to help pay for the system.

However, the Executive decided instead to completely scrap two Terminals and try to recover some money by selling off the parts. Because of the specialized nature of the parts, only a third were ever sold for a total of \$186 (a \$98 loss). The remaining parts were left sitting in the office kitchen.

Surprisingly, only \$97 was put back into the system budget. Although there are no receipts, it turns out that somehow \$49 was given to the Engineering Stores, and this year's Executive spent the remaining \$40 to buy beer and pizza for a summer meeting.

Plummeting Prices

The steady drop in the price of integrated circuits is the main reason that calculator you bought last year is so much cheaper now. This trend is reflected in the value of some typical system components bought over a year ago:

PART	PAID	COST NOW
1802 microprocessor	25.99	15.68
8275 CRT controller	145.72	72.86
9551 USRT	12.33	6.93
9555 I/O port	8.56	6.93
74C174 latch	1.86	1.25
74LS169 counter	6.06	1.39
76477 synthesizer	5.81	4.18

The average price drop for the above parts is 31%. Based on an average of 25% for all the system IC's already bought, SBS estimates that the total depreciation in new (replacement) cost is over \$350.

Hardware Writeoffs

Since much of the system is already assembled, a lot of the hardware can only be disposed of as scrap. This includes over \$600 of circuit boards (and camera work, supplies, etching, sockets etc.) without documentation, and SBS estimates more than \$250 of assorted other materials (modified cabinets and keyswitches, used solder, wire, integrated circuits, literature, dull drill bits etc.) for a total of over \$850.

What's It Worth?

The parts cost of the system can be determined from the Eng Soc General Ledger (account #101), corrected for the 'leftover' sale return (see "Selling the Surplus").

Ledger total	6,224.65
- 2 extra Terminals	746.21
+ leftover sale money	89.00
Total system cost	\$,567.44

Total system cost	\$,567.44
-labour	1,172.00
-cash float	400.00

Components and materials 3,995.44

The amount likely to be recovered from a sale of the parts can be estimated by first subtracting the cost of scrap hardware (see "Hardware Writeoffs") and depreciation on the integrated circuits (see "Plummeting Prices"):

Parts cost	3,995.44
-hardware writeoff	850.00
-IC depreciation	350.00

Replacement value of saleable parts 2,795.44

Assuming that all of the remaining parts can be sold, at the 60% return expected by the Executive the total would be \$1,677. At the typical rate of 25% quoted by electronics surplus stores, the total would be under \$700.

Maximum return at 60%	1,677
Maximum return at 25%	700

Special Report of the Vice President: Administration

This report was prepared by the Vice President and presented to the Society in order to explain how the decision was finally reached.

In the spring of 1978, the Executive Committee of Council was approached by Eric Hartwell with the suggestion that he could provide the Society with an electronic "Text entry and editing system" for a reasonable cost. This device was intended to serve two purposes. First, it would allow Toike editors to review and correct (ie, "edit") articles by storing them on magnetic tape (ie, "entering") and then sending them off for typesetting the right way on first try. The corrected tapes could be fed directly into the typesetting machine owned by some other organization (Eric Rosen Enterprises was specifically in mind). This would secondly reduce cost, as the feed to the typesetter would be at machine speed, and the copy would already be correct.

The convenience of the first aspect was the purpose; future savings were a justification for this convenience. Eric Hartwell presented a proposal to the

Executive Committee, who appointed Dana Williams to investigate the proposal. He finally reported back that it seemed fine, although little hard data was given to support this judgement. This proposal was presented May 24, 1978; a contract with Steel Breeze Systems; a registered Ontario company owned by Eric Hartwell; was signed by Rob Yates and Larry Funnell for the Society on June 20, 1978. Our copy of this contract is available in file #1011.

The contract specified the number and type of pieces of equipment in the system; that the Engineering Society would purchase the parts while SBS selected them and their source; that SBS would undertake construction and testing, with "every reasonable effort to deliver the fully operational system on or before September 8, 1978"; that SBS would keep the Executive informed on progress via reports to each committee meeting until delivery; some items regarding guarantee and user manuals,

etc; and specifying payment to SBS as \$500 advance, \$500 on July 10, 1978 and \$500 on delivery. Procedure for contractual change was also specified. System cost specified in the contract as \$4150 + 5% + tax (\$4393-\$5077), plus the \$1500 for labour. (\$6577 Maximum)

On July 18, 1978 the specs were amended, not affecting the overall costs but giving a new breakdown. On January 31, 1979 the specs were again modified but no breakdown was given. On March 8, 1979 the final amendment was signed, calling on the Eng Soc to "continue to provide SBS with working facilities and access to same... and access to the equipment for maintenance and upgrading..." At the time, the delivery date was finally altered to "SBS will endeavour to deliver the fully operational system on or before August 27, 1979. SBS will pay \$35.00 to the Society for every full week that... (delivery is delayed).

A similarly careful analysis of the original proposal yields the fact that SBS called for the original September 8, 1978 deadline if work started by May/78. I quote, "It is estimated that the total design time will be of the order of 300 hours, but

can be completed within three months." In fact, this estimate appears to have been at least one order of magnitude off. And experience did not improve accuracy; on July 25, "Things are still going pretty much as hoped"; finally, on August 23, "...proceeding fairly well, but is now about two weeks behind schedule"; then on Sept. 6, "The system should be ready for the second Toike makeup on Sept. 23, except of course for any parts which aren't." Then, on September 20, "the project is three to four weeks behind schedule... due mostly to... parts..." Well, we could go on. The system still is not. And when I last talked to Eric about it, he predicted perhaps 4 weeks to a partially operating system (although he would not give any sort of guarantee; at least he has learned something) as long as the prevailing hassles cleaned up (they did not).

On September 27, 1978, his progress report (justifiably) berated those execs. responsible for part of the delay. Both last year and this, executive members have reneged on promises to aid Eric in order to lighten his workload and speed things up. This has contributed significantly to delay time; BUT the overwhelming blame for delay still lies with SBS failing to anticipate some very predictable problems e.g. delays in shipping. It was in fact not until the 1978-79 Year End Report that Eric finally admitted that he had gotten in over his head, and that his cost and time estimates were in error. (If interested, come to the Eng Soc offices for a copy.)

The central cause of delay thus far has been Eric's work on his M.A.Sc. thesis, which is now complete. However, as a result of poor tact on the part of executive members informing Eric of the results of the September 11/79 Executive meeting, he said he no longer wished to work on the system for us.

So where does this leave us? We have spent \$5,666.95 from account #1011 for system-related items. Of this, \$1000 was the payments due SBS - \$500 was a float for use in purchasing parts, in care of SBS. In the Jan. 22/79 SBS report, this amount is confirmed. Thus, equipment and services totalling \$4166.95 have been purchased. We have no idea as to when these parts will become a system; some people suspect whether they ever can become one. No sale of these parts could raise more than 60% of that money spent (about \$2500). Legally, we need not pay

SBS the last \$500, and \$500 (the float) is due to us. Hence we could conceivably regain \$300, but no more.

According to Cassels Brock (lawyers) we could also have pushed SBS to finish the project; however, the economics of using the system as specified seem poor, according to data from John Byrne. Eric Hartwell disputes John's figures, but given a choice I prefer to trust John. And to change the specs means to change the contract; to this, Eric specified to Gary Jones in a letter dated May 15/79, the following: "You are well advised to read the contract over very carefully. As of now, you are going to get exactly what is specified there. Any changes are going to cost you money. (my emphasis) And the madder I get, the higher my price goes." Eric is already quite mad.

Pushing him to complete against his will would result in personality headaches, plus further costs of some kind in a year where we are financially stressed. Plus, the delivery date and performance of the equipment are highly debatable.

Terminating the contract means that at least \$2666.95 have been squandered through incompetence; Eric's, our last executive's, and yes, our executive's too. Even if the results were certain, John Byrne's data indicate a prohibitively long pay-back time. It just ain't worth it.

Thus, with the support from the vote of the last full meeting of Council, I have sent a registered letter to SBS' business address specifying termination of the agreement. According to Canada Post, this letter has been delivered and hence we have now legally terminated our agreement with Steel Breeze System.

I feel, along with the rest of the Executive, that this result is in the best interests of the Society. I hope that upon considering the information presented here, you agree. For those who still doubt, file #1011 is open for perusal by any interested Society members (not just class reps). Warning-it makes for several hours' reading and is not to leave the Eng Soc offices. Thank you for reading and caring!

Yours,
Ken Smith
V.P., Admin.



Steel Breeze Systems Replies

After reading the report of the VP Admin, Mr. Hartwell of Steel Breeze Systems expressed his wish to comment on a few points.

Performance

Naturally, both "the delivery date and performance of the equipment" are specified in detail in the contract, along with free servicing for eight months and so on. One unit (the Interface) has been working since last January, and another (the Editor) was assembled, partially working and having its software written and debugged when the decision was made to scrap them.

At this point, the delivery had been held up for over a month waiting for the Executive to decide which machine to interface to.

Had the delivery run behind schedule, I would have been paying a \$35 penalty for every week it was late, giving the Society a steady income instead of the definite loss it now faces. Incidentally, because of the nature of the company and Canadian law, bankruptcy is not a way out of this fee.

"Poor Tact"

As Mr. Smith reports, the final factor in convincing me of the utter futility of trying to do business with the Eng Soc was the "poor tact on the part of Executive members" in telling me they had decided to scrap the system.

The President, Gary Jones, stated that the Executive had decided they didn't want the system, and therefore no longer felt bound by the contract and had no intention of paying the \$500 owing for work done last year. However, he said that as long as I gave them \$3,000 cash within a week, they'd probably call it even and let me have the parts.

Since I believe that the decision was made on the basis of questionable information, I tried to explain that it's definitely not in anyone's best interest. Furthermore, any motion by the Executive has to be approved by Council before it's official. However, Jones explained that since the Exec had already accepted those 'facts' there was no point in disputing them, and he maintained that the word of the Executive is absolute.

When I pointed out that a written contract can only be cancelled by the written agreement of both parties, and asked that we go to Legal Aid or a

lawyer to have this drawn up, Jones again maintained that the word of the Executive is absolute and flatly refused to get legal assistance of any kind. Nevertheless, later that same day he had some student lawyers analyze the contract, and later that week he sent the entire file to the University's lawyers, claiming I was threatening to sue the Society.

Delays

To quote from the 78/79 Year End Report, "Undoubtedly the biggest problem with the system is that the projected completion date turned out to be totally unrealistic." The report goes on to outline a number of reasons, including my inexperience, foot-dragging and quibbling on the part of the Executive, and buying parts.

As Mr. Smith reported, I hadn't budgeted for the estimated 200 hours I spent buying the parts. However, he neglected to mention that the reason for this is that, despite the fact that the contract requires the Eng Soc to go and buy the parts, the Executive simply refused to do so. I was left in the situation where if I didn't do it myself instead of working on the system, then it would never have got done.

These and other problems were forced on the Executive's attention in a report in January/79 (a bit before the Year-End report in June), when I asked them to set up a special committee to take some action. They refused.

Nevertheless, since I felt responsible for the underestimation of the design and construction time, I continued working on the system (to date over 10 months full-time) without any extra pay. For their part, the Executive extended the deadline by year and added the penalty clause.

Contract Changes

It is unfortunate that Mr. Smith chose to quote out of context from an unofficial letter (clearly marked 'personal'), since the implication is that it applies to interfacing.

This July, the Executive commissioned and paid for a detailed feasibility study on interfacing the system to other photosters, particularly the newspaper's machine. In-

cluded in the \$172 price of the study was a firm and legally binding quotation for the cost of the change. Despite the fact that it would mean a significant modification after the Interface was built and tested, the total would have been under \$50 for parts plus a guaranteed \$250 for all the extra labour.

Costs

Despite Mr. Smith's statement to the contrary, the parts costs are precisely on budget with over 90% bought. If you do check the Year End Report as he suggests, you'll actually find that last year's Executive somehow budgeted \$1,000 less than the total cost specified in the contract.

Economics

The figures concerning the economics of the system as presented to the Executive and Council can be disputed, as may be seen elsewhere in this issue.

Perhaps the reason Mr. Smith disputes "my" figures may be found in a quote from a personal letter he sent me: "I do try to do what I think is right. And I hate like hell having to compromise right with real..." Don't bother refuting things I've stated here as facts, because I do consider them to be facts."

Legalisms

It's a good idea to realize that the difference between a company and a person is quite important, especially when things like contracts are involved. Despite the impression given by Mr. Smith's report, the contract is between the Engineering Society and Steel Breeze Systems. It's not between the Eng Soc and myself any more than it's between SBS and Rob Yates.

As for Mr. Smith's statements about what is "legally" so, I can only say that if things were so simple there wouldn't be any lawyers. The contract may have been broken, but is not yet legally terminated. The only way it can be ended is by a written agreement or a court ruling, as any first year law student can easily explain.

Hopefully, we will soon be able to draw up an agreement concerning the closing of the contract and the matter can be officially retired.

Yours sincerely,
Eric Hartwell
Steel Breeze Systems

An Open Letter to the Members of the Engineering Society

I have been working on your Text Entry and Editing System since before May of 1978, and despite all the trials and tribulations involved, the most regrettable thing that has ever happened is the Society's recent decision to kill it.

I am most grateful to the Cannon staff for giving me the opportunity to help them present some of the story behind the system to you, the students who have already paid over \$5,600 for it. I'm only sorry that I couldn't be writing a report about the successful completion of the projection as everyone had hoped.

It should be obvious that I think that scrapping the system at this late date is a big mistake. It's especially hard to understand when you consider that over 90% of the parts have been bought, one of four units has been working since last winter, and the system was on the verge of being operational when the Executive decided to scrap it.

The decision seems to have been made strictly of financial grounds, though the primary reason in the first place was to make it easier for the people who have to put out the Toike, the Cannon and all the other publications. When you buy a new typewriter, do you make your decision purely on the basis of how many years it will take to "earn back" its cost? It seems a bit ridiculous. However, according to the Executive, 8 years is too long to earn back \$6,000 and it is better to take an immediate loss of thousands of dollars to get some cash now.

Why weren't the eventual system users, the members of the Communications Committee, even asked for their opinion before their chairman recommended that it be scrapped? Surely they would have had something constructive to add. If

using the system means the Toike editor works 5 hours less each issue, meaning he can go to a few classes and get 5% more in a course, how much has it really saved?

A major problem seems to lie with a peculiar attitude among many members of the Executive Committee, who find themselves lacking the time to find out what is really involved yet eager to exert their authority whenever they see the chance.

As I have said, I think the decision was made for the wrong reasons and based on weak data, and I tried to convince them of this. Perhaps the real problem is summarized in an official Sept. 14/79 letter from the President, Gary Jones: "For us were (sic) probably making a big mistake but the decision (sic) has (sic) made and we have to live with it."

This is, if nothing else, a bit presumptuous, considering that the Council wasn't even informed of it until five days later, let alone asked.

Judging from the way the motion was forced through Council before it could be fully discussed, perhaps once the Executive has made a stand there is truly no chance of hacking down.

If the system really wasn't wanted, why not wait a few weeks (possibly even collecting a penalty fee in the meantime), and then sell off a complete operating system instead of a bunch of scrap? The loss on parts sales alone would be horrendous, not to mention the total waste of all the time spent on it over the past year and a half.

At any rate, the way things stand, the Society loses, I lose, and you, the students, lose as well. Perhaps, at least, a lesson has been learned.

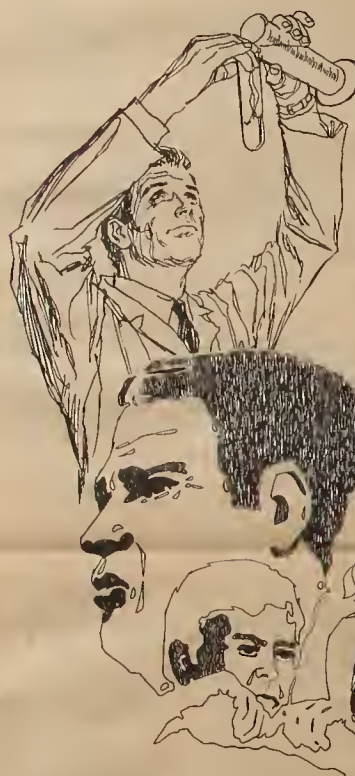
Yours sincerely,
Eric Hartwell
Toike editor 75-76, etc.

The Cannon hopes that its readers have been able to formulate an intelligent opinion based on the comments and facts that we have presented — after all, that's what The Cannon is all about.

Personally we feel that this should have been resolved earlier and that it has gone on too long. If anyone still cares, there is more information available in the Engineering Society offices.

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Galbraith Building,
Room 248, 2:00 p.m.

CHEMICAL ENGINEERS:
Product Development

Galbraith Building,
Room 248, 3:00 p.m.

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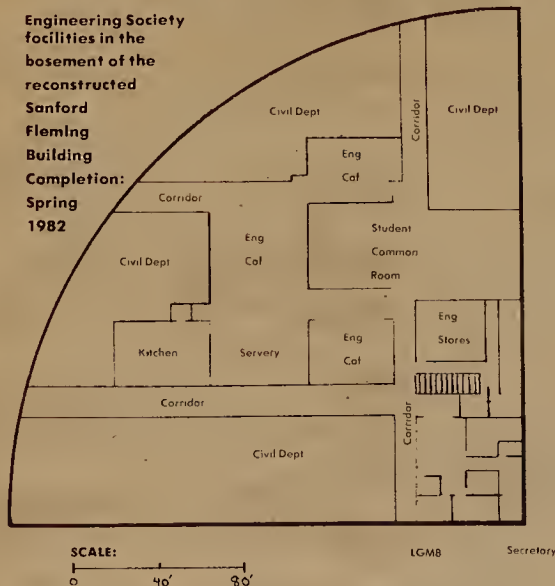
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CONSTRUCTION???

Yes, we did check it out and something is happening.

Engineering Society facilities in the basement of the reconstructed Sanford Fleming Building
Completion: Spring 1982



KEY

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Janitor rooms
Mens and Womens Locker room and washrooms
Athletic Stores
Darkroom
Toke Cannon Office
V.P. Office
President's Office



Capping of another Oktoberfest

Look what design has done for the toothbrush

What makes the new Reach toothbrush design different from others? It's the fact that from the shape and the length of the handle to the toothbrush head, human factors were the main concern.



There are few products in such general use as the toothbrush. Almost everyone brushes with some regularity and children, from an early age, are instructed that brushing helps prevent cavities and maintains healthy gums.

Nonetheless, despite frequent exhortations from dentists that proper brushing is essential to a healthy mouth, people persist in being sloppy about their dental hygiene. In fact, it's estimated that the average person spends only about 65 seconds at each tooth brushing.

Although the earliest mention of toothcleaning implements is found in Chinese records of the 17th century, the toothbrush as we know it is the creation of William Addis. Addis, an Englishman, designed the first toothbrush in 1780. Addis' toothbrush had a bone shaft and natural bristles. The bristles were drawn through holes bored in the head of the bone shaft and were secured by wire.

The first American toothbrush wasn't patented until 1857, but since then American ingenuity has more than compensated for the slow start. Today, there are hundreds of patents covering various aspects of manual and mechanical brush design and operation.

One of the more significant developments in modern toothbrush design occurred in the 1930's at a DuPont plant in Leominster, Massachusetts. It was there that nylon monofilament was first sub-

stituted for hog bristles. This development substantially increased DuPont's product volume.

In an effort to make another such quantum leap, DuPont approached the Applied Ergonomics Corporation of Westwood, Massachusetts, in 1972.

Two of the principals in this company, Percy Hill and John Kreifeldt, are also professors in Tufts University's department of engineering design. A third, Louis Calisti, is a dentist.

DuPont's objective was simple. It wanted to increase sales of its nylon and plastics products, so it asked Hill and Kreifeldt to design an improved manual toothbrush. Among DuPont's requirements were that the toothbrush outperform competitive products and that it be commercially practical.

Applied Ergonomics started on the project by reviewing existing information on the design of tooth-cleaning devices—especially their comparative effectiveness in protecting dental surfaces from materials that cause cavities and other tooth problems.

Human factors not used

From this research, Applied Ergonomics selected more than 65 articles and studies and 115 patents for intensive study. These patents covered such areas as bristle configurations, handles and grips. "Significantly," Kreifeldt says, "we found no human factors research on toothbrushes in any of the material we reviewed."

At this stage in their research, it became apparent to the design team that plaque removal was the primary objective, with gingival (gum) massage second.

The consensus of the dentists was that the most important consideration in improving toothbrush design was to develop a model that would provide better plaque removal.

The design team then began a study of the public's dental care habits and attitudes by means of a questionnaire

distributed to 300 adults. Purpose of the survey was to determine individual brushing habits and to learn what the respondent's regarded as their main tooth problems.

What's best in a toothbrush?

Says Hill, "From respondents to our questionnaire we also learned that the toothbrush with the greatest appeal is the one that is a comfortable size; has a full brush-head of white, level bristles, and a plain, simple handle." In addition, the questionnaire indicated that a firm brush is preferred. However, in their research the design team found that persons who use hard bristles frequently damage their tooth enamel and also are more likely to suffer gum trauma.

After analyzing the results of the questionnaire, the design team made comparisons of the forms of many toothbrushes. Says Kreifeldt: "We compared the length and width of the head and handle and the weight of the toothbrush. We also compared other features such as bristles, and then grouped the toothbrushes according to their various features and their price."

At the same time, the designers obtained detailed measurements of hands, teeth and mouths. With this information, they were able to evaluate the geometry of existing brushes and to set physical specifications for the toothbrush they were developing.

After approximately eight months of research, however, the design team found it still needed additional information. "It was clear," says Hill, "that we had to get more facts about how users handle a toothbrush, and the relationship of the toothbrush to the specific dental areas."

Consequently, the design team made a series of time-motion studies to obtain details on the way people brush their teeth. They studied how much time people devote to brushing different mouth areas and the stroke direction they use. They

also examined the way people manipulate the brush.

Work up prototypes

Using information from the questionnaire, the time-motion and plaque-removal studies, the designers drew up a list of specifications. These specifications led to development of two prototypes.

"Each of the prototypes," Hill says, "had individual characteristics which required testing. For example, one prototype had a bilevel bristle-head, with soft outer bristles and firm inner bristles."

The firmness of the inner bristles was achieved partially by using a wider bristle and partially by extra dense packing of the bristles. The extra density of the bristles was made possible by using a hexagonal rather than a linear hole arrangement.

"What we found," says Hill, "was that the firm feeling, desired by many users, can be achieved without using hard bristles which often cause tissue trauma." This prototype had a slightly rounded handle that tapered toward the bottom end.

The alternative prototype had bristles of the same diameter, but slightly shorter in length. According to Hill, shorter bristles increase the feeling of firmness. The handle of this prototype was also tapered toward the bottom, but it was trapezoidal in cross-section. Both designs were produced in sufficient quantities to test their effectiveness in plaque removal and also to measure consumer acceptance to the new product.

The prototype toothbrushes were then evaluated against two other commercially available toothbrushes. Test results showed that both prototypes were superior to the others in removing plaque.

Interviews with users indicated a preference for the head of the bilevel prototype and the trapezoidal handle of the other. As a result, the designers blended the best features of the two prototypes into a new product, called the Reach toothbrush

(trademarked name).

The Reach toothbrush has tightly packed bilevel bristles arranged hexagonally. The raised outer rows of .007-inch diameter bristles provide gingival cleaning. The inner bristles, .010-inch in diameter, are designed for plaque removal.

Reach has a slender, elongated neck that joins the head to the handle. According to the designers, this neck makes it easier to get at hard-to-brush areas, particularly the back teeth.

The Reach toothbrush has the smallest and most compact brush head on the market. Studies show that it suits adult mouths of all types, regardless of dental arch variations. As Hill points out, "The small toothbrush head makes the user concentrate more on brushing. The user does two teeth at a time, not four or five."

The Reach toothbrush's angled, shaped handle is designed to provide a comfortable grip and to be easy to manipulate. A further refinement is the contoured area for the thumb at the joint of the handle or neck which makes brushing easier.

Get client support

Reach was introduced nationwide last fall by Johnson & Johnson, which acquired the rights to the product from DuPont earlier this year. J&J is sanguine about Reach's market potential. "The Reach toothbrush is not just another toothbrush," says Richard Czerniawski, "but a major innovation in home dental care." Czerniawski is the Reach product director at Johnson & Johnson.

Describing the company's plans for promoting the product, Czerniawski says, "Reach's marketing program will include year-round TV advertising and professional, trade and consumer promotions. This is the first for home dental products."

Reprinted from INDUSTRIAL DESIGN, Nov/Dec 1977 issue

TINY TOIKE PAGE

October 10

Executive Meeting
North Dining Hall
Hart House
5:15 p.m.

October 11

Social Committee Meeting
1:00 p.m.
In the Engineering Stores

Civil Smoker for F!ROSH and
Second years.

5 p.m. Galbraith Room 202
Refreshments Available
Topic: Intro To Civil
Engineering

October 12

Oktoberfest

6:00 p.m. to 1:00 a.m.
Drill Hall
Admission \$3.50
Tickets available at the Stores

Football

7:00 p.m.
Football Game: Laurier at
Toronto Varsity Stadium

October 15

NOTICE TO ALL COUNCIL MEMBERS:

There will be a full
council meeting on monday,
October 15th
gb 202.

October 17

IEEE McNaughton Centre Opening
12 noon at Convocation Hall

October 19

Cosmopolitoike Makeup
5 o'clock in the Toike-Cannon Offices
Only Women Welcome!



Oct. 10, 1979. Bob Moul's Birthday.

Viewpoint on Leadership

This article is the first in a series intended as a guide for those with aspirations to lead. The opportunities for leadership in engineering are in fact outstripped by the necessity of leading. The fact of being a part of "management" in most companies makes it essential to understand how to deal with the people you work with; for example, how to treat technicians or machine operators when getting them to do a job for you. The material I'll give here is from personal experience (including courses on the subject). I'll try to indicate some good alternate sources as I go along.

Leadership is the art of influencing people to accomplish some purpose. As with most engineering work, experience is needed to gain proficiency in attaining this influence in any particular situation. Leaders are NOT born! Expertise comes at the price of hard work and a realization that you can and must always do better. There are several "qualities" that the prospective leader should examine in this process of improvement and refinement. The more important of these are confidence, integrity, ability, self-discipline, and sense of responsibility.

Confidence has been called the "lifeblood of leadership." A leader must be sure that his purpose is worthwhile, or his followers may come to doubt their goal. He should have confidence in his superiors and associates, knowing their capabilities and the degree of support available from each, and expected from him in

return. In a similar vein, the leader must be secure in his knowledge of the abilities of his followers.

This does not mean that if your superiors, associates or followers are less than perfect, all is lost. All of these are people, no less than yourself in that respect. The key to effective leadership is to treat them all as equals worthy of respect, and to know their capabilities and limitations in order to employ them to the greatest effect. That is what I mean here by confidence. Leadership seems nothing but a sea of troubles; your boss may be a tyrant (not having read this article series), your associates may all be bucking for promotion at the expense of others including yourself, and slackers and disrupters will appear amongst the work force you have available. The key is for you to know who to rely on for what; you must get to know all concerned, preferably at a personal level. And to do that, you must not just treat, but actually know them as your equals.

The most important point, however, is self-confidence. If you don't think you can do the job, you'll never keep anyone else convinced that you can do it. As I've hinted above, confidence is based on straight knowledge. If you have all the available facts, and know how to apply them, sound judgement is bound to result. If you take care to know what you are doing, you'll achieve your aims and the success will help reinforce your self-confidence; this is one of the rewards of leadership. It is, however, im-

portant to remember to pass on the benefits to those who did work for you. Better results in the future result from, "Hey, guys—you did a great job, take off early," than from basking in the limelight of praise from your superiors. Praising your followers raises their self-confidence; conceit turns everybody off.

"A great leader is someone who has great ideas and the ability to express those ideas. If he lacks that ability to express his ideas, perhaps he doesn't really have them." —Arthur Hill, from the program *Leadership*, part of the "Human Journey" TV series. The expression of confidence is almost as important as the possession of it. An honest "I'm confident in your abilities..." or "We can handle it" is valuable in allaying the uncertainties of others involved in your project, freeing them further to do their job properly. Particularly if the statement of confidence is well based in past performance.

In summary: Leadership is an important study for the enterprising engineer. One essential to effectively influencing others to achieve some goal is confidence. The main areas to consider are whether the goal is worthwhile, whether you can count on those above, around and below you to do their part, and that you have the personal skill and knowledge to bring the project to a successful conclusion. It is important to share your confidence and the praise at completion of the task if the best results are to be achieved.

by Ken Smith

the CANNON

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The CANNON is a publication of the University of Toronto Engineering Society. It is published to announce EngSoc events, discuss Faculty and educational matters, present technical and University news and to be an open forum for the opinions and interests of members of the Faculty. All those who would like to help with the CANNON are most welcome.

Submissions to the CANNON are also welcomed. They should be typed. The deadline for submission of articles for the upcoming Tuesday's CANNON is Thursday at five. EngSoc announcements must be in by noon Monday. The editor reserves the right to edit letters.

The CANNON office is located in the EngSoc offices: Third Floor, Old Metro Library, 20 St. George St., University of Toronto, M5S 2E4.



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Deadlines for these companies are coming up shortly, some as soon as tomorrow. Don't miss these opportunities! For more information, go to the Placement Centre.

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